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Cree Lighting Company

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Filing Recommendation	For IP Committee Use
IP Committee Review Date:	Disclosure Number: <u>D0223</u>
Committee Recommendation:	Date Opened: <u>[REDACTED]</u>
<input checked="" type="checkbox"/> File: Disclosure Complete <input type="checkbox"/> File: Prepare Full Disclosure <input type="checkbox"/> Do Not File	<input type="checkbox"/> Publish Without Filing <input type="checkbox"/> Review Further <input type="checkbox"/> Keep as Trade Secret
Comments:	

Invention Disclosure	To: Intellectual Property Counsel
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1. Invention Title: Composite White LED Chip and Method for Making Same

2. Inventors:

	Inventor No. 1	Inventor No. 2	Inventor No. 3
Full name	James Ibbetson	Eric Tarsa	
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Work Phone	[REDACTED]	[REDACTED]	
Citizenship	[REDACTED]	[REDACTED]	
Department			
Manager	Bernd Keller	Bernd Keller	
Wrote Disclosure	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Attach additional sheets if necessary

3. Date invention conceived: [REDACTED] Date invention reduced to practice: [REDACTED]

4. Research sponsor (if applicable): _____ Contract No.: _____

5. Identify any disclosures of the invention outside the company. For example, identify any publication, abstract, offer for sale or sale, discussions with suppliers or customers, etc., in which the invention was described. Give the date and place of any such disclosures (attach additional sheets if necessary):

[REDACTED]

6. Identify any anticipated disclosures of the invention outside the company.: _____

7. Identify any related inventions or disclosures by UltraRF personnel: _____

8. Identify products in which the invention may be used: White chips and white lamps, or anything similar in which a phosphor-loaded coating needs to be applied to an LED chip.

Remember to have each page of your invention disclosure signed and dated by a witness.
Please attach this cover form to your invention disclosure, along with any relevant documentation. Submit the disclosure to Bernd Keller, x222.

Inventor's Full Signature	Date	Witnessed, read and understood:	Date
(1) <u>[Signature]</u>	<u>[REDACTED]</u>	(1) <u>[Signature]</u>	<u>[REDACTED]</u>
(2) <u>[Signature]</u>	<u>[REDACTED]</u>	(2) <u>[Signature]</u>	<u>[REDACTED]</u>
(3) <u>[Signature]</u>	<u>[REDACTED]</u>	(3) <u>[Signature]</u>	<u>[REDACTED]</u>

Description of Invention

Answer each of the following questions about your invention. Use additional space or attach additional sheets as necessary. Attach copies of notes, diagrams, lab notebooks, and journal articles, etc. if available. Have a witness sign and date each sheet of the disclosure, including additional sheets.

1. Provide a brief description of the invention. What problem does it solve, and how does it solve the problem?

The invention describes a novel, composite LED chip in which a 'pre-fabricated' phosphor-loaded shell or lens is attached to a base semiconductor LED chip in order to create, for instance, a white-emitting LED chip, and a method for creating said composite chip. The problem addressed is the difficulty one has to surround a chip with a thin but uniform coating of phosphor. The problem is solved by preforming said coating as a shell or lens by some sort of molding technique, then attaching it to the chip either with a transparent epoxy and/or additional curing.

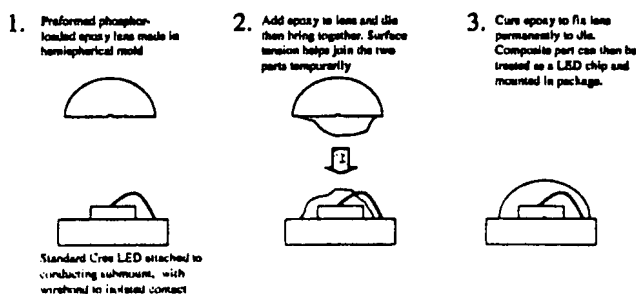
2. How does the invention differ from present technology? What are the novel or unusual features of the invention? What advantages does it possess?

Present technology either applies the phosphor-loaded encapsulant as a liquid such as silicone or epoxy that is subsequently cured to form a solid or gel, leading to a non-uniform coating, or uses a stencil and screen-printing to provide a uniform coating. The invention is novel in creating the coating as a separate, solid shell that is then bonded to the chip. Advantages of this approach include:

- o Easier to control thickness uniformity of phosphor coating
- o Shell or lens can be tested and screened or binned for uniformity and color separately, thereby improving overall yield of the composite chip
- o Easy to adapt to a non-cubic chip shape
- o Increases choice of possible materials that can be used for the phosphor-loaded encapsulant since the shell or lens is formed separately from the chip
- o Facilitates the fabrication of white LED chips with a vertical contact scheme by allowing access to the top contact for a suitably formed shell or lens.

3. Describe specific embodiments or examples of the invention, if any. Does the invention have any alternative embodiments? Enclose sketches, drawings, photographs and other materials that help illustrate the description.

The following embodiment has been demonstrated. It was intended as a quick, inexpensive version of the invention described, and is rather crude and large but it makes the concept clear.



Desirable embodiments involve scaling down the size of the lens to something just slightly large than the LED chip, with a hollow interior that mirrors the chip dimensions. If possible, such a phosphor-loaded shell would include a hole large enough for a wirebond so that it could be used without a submount. If not, the submount design would be developed to take a lateral contact chip.

See attached pages from notebooks for more details.

Inventor's Full Signature	Date	Witnessed, read and understood:	Date
(1)		(1)	
(2)		(2)	
(3)		(3)	

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4. What are possible applications for the invention? In addition to immediate applications, are there other uses that might be feasible in the future?

Anywhere a white LED lamp is used (or indeed any other color produced by down conversion). Examples include cell phone and display backlighting, and solid-state illumination.

5. List any documents or publications that relate to important aspects of this invention.

[REDACTED]

Inventor's Full Signature		Date	Witnessed, read and understood:		Date
(1)	<i>[Signature]</i>	[REDACTED]	(1)	<i>[Signature]</i>	[REDACTED]
(2)	<i>[Signature]</i>	[REDACTED]	(2)	<i>[Signature]</i>	[REDACTED]
(3)			(3)	<i>[Signature]</i>	[REDACTED]